

IN THE CLAIMS:

Claims 1-50, including current amendments to claims 1, 18, 20, 34, 35 and 38, in addition to new claims 41-50, are set forth below. Claims 14-16 and 19-20 are cancelled. Please amend the claims as indicated and add claims 41-50 accordingly.

1. (Currently Amended) In a method of preparing a bonded sputter target/backing plate assembly comprising a target composed of a metal or alloy to be sputtered and an underlying metallic backing plate member, an improved method for joining said target and backing plate along mating surfaces thereof, comprising:

a) forming a plurality of projections in at least one of said mating surfaces ~~to extend into and mechanically lock over the other of said mating surfaces;~~

b) positioning said target and backing plate adjacent each other to form an assembly having an interface defined by said mating surfaces;

c) pressure consolidating said assembly under low temperature conditions less than 38°C to bondingly join said target and backing plate together with said projections penetrating into and mechanically locking over the other of said mating surfaces.

2. (Previously Amended) Method as recited in claim 1 wherein said assembly comprises a peripheral boundary surrounding said projections and wherein said method comprises the additional step (d) of bonding said assembly proximate said peripheral boundary.

3. (Original) Method as recited in claim 2 wherein said step (d) is performed after said step (b) and before said step (c).

4. (Original) Method as recited in claim 3 wherein said step (d) comprises e-beam welding of said peripheral boundary.

5. (Original) Method as recited in claim 4 wherein said step (d) further comprises interposing a weldable filler material between said target and said backing plate proximate said peripheral boundary.

6. (Original) Method as recited in claim 2 wherein said step (d) comprises friction welding.

7. (Original) Method as recited in claim 2 wherein said step (d) comprises TIG welding.

8. (Original) Method as recited in claim 1 wherein said target comprises Al, Cu, Ti, Co or their alloys.

9. (Original) Method as recited in claim 6 wherein said backing plate comprises Al, stainless steel, Cu, Ti or their alloys.

10. (Original) Method as recited in claim 6 wherein said target comprises Cu.

11. (Original) Method as recited in claim 2 wherein said step (d) comprises e-beam welding said target along an annular zone located adjacent said peripheral boundary.

12. (Original) Method as recited in claim 1 wherein said step (c) comprises pressure consolidating said assembly at about room temperature.

13. (Original) Method as recited in claim 2 further comprising (e) low temperature annealing said pressure consolidated assembly.

14. (Cancelled).

15. (Cancelled)

16. (Cancelled)

17. (Currently Amended) Method as recited in claim ~~16~~ 1 wherein said low temperature is about room temperature.

18. (Currently Amended) Method of bonding a sputter target to a backing plate member along a plane defined by mating interfacial surfaces of said target and backing plate, said method comprising:

- a) forming a plurality of salient portions in one of said interfacial surfaces, wherein said salient portions have at least one edge and a projection tip connected to said edge;
- b) positioning said target and backing plate in a position ready for bonding with said interfacial surfaces adjacent each other; and consolidating said target and backing plate at a temperature of less than 38°C ~~about 50% of the melting point of the lower melting member of said target and said backing plate~~ and at a pressure sufficient to deform said at least one edge so that said at least one edge forms a re-entrant angle relative to said plane of less than 90° and said projection tip penetrates into the other of said interfacial surfaces and forms an angled mechanical locking grip over the other of said interfacial surfaces to bondingly join said target and backing plate together.
- c) consolidating said target and backing plate at a temperature of less than about 38°C ~~50% of the melting point of the lower melting member of said target and said backing plate~~ and at a pressure sufficient to deform said at least one edge so that said at least one edge forms a re-entrant angle relative to said plane of less than 90° and said projection tip

penetrates into the other of said interfacial surfaces and forms an angled mechanical locking grip over the other of said interfacial surfaces to bondingly join said target and backing plate together.

19. (Cancelled)

20. (Cancelled)

21. (Currently Amendment) Method as recited in claim ~~20~~ 18 wherein said step (c) is conducted at about room temperature.

22. (Original) Method as recited in claim 18 wherein said target is Al or Al alloy.

23. (Original) Method as recited in claim 18 wherein said target is Cu or Cu alloy.

24. (Original) Method as recited in claim 18 wherein said target and backing plate have a peripheral boundary portion circumscribing said salient portions, said method further comprising, prior to said step (c), a step (d) of bonding said target and backing plate member around a peripheral boundary portion of said mating interfacial surfaces.

25. (Original) Method as recited in claim 24 wherein said step (d) comprises interposing a weldable filler material between said target and said backing plate along said peripheral boundary portion.

26. (Original) Method as recited in claim 24 wherein step (d) comprises e-beam welding.

27. (Previously Amended) Target/Backing plate assembly made by the method of claim 1.

28. (Allowed) Combination comprising a sputter target and backing plate, said target and backing plate mating along a plane defined by mating interfacial surfaces of each, a plurality of salient portions formed in one of said interfacial surfaces and having at least one edge and a projecting tip connected to said edge, said edge being bent at a first re-entrant angle of less than about 90° relative to said plane and said projecting tip forming a second re-entrant angled locking grip extending into the other of said interfacial surfaces.

29. (Allowed) Combination as recited in claim 28 further comprising a peripheral zone surrounding said salient portions, and a bondable filler material positioned in said peripheral zone.

30. (Allowed) Combination as recited in claim 28 wherein said backing plate comprises Al alloy and said target comprises Al, said salient portions comprising substantially "M" cross sectioned ridges formed in said backing plate with said ridges provided along said interfacial surface of said backing plate in a plurality of concentrically arranged rows.

31. (Allowed) Combination as recited in claim 28 wherein said target comprises Cu.

32. (Allowed) Combination as recited in claim 28 wherein said salient portions include substantially "M" shaped cross-sectioned ridges and wherein said at least one edge is bent at an angle of about $35-80^\circ$.

33. (Allowed) Combination as recited in claim 28 wherein said salient portions include substantially "V" shaped cross-sectional ridges, each said "V" shaped ridge having a pair of edges bent at re-entrant angles.

34. (Currently amended) In a method of preparing a bonded sputter target/backing plate assembly comprising a target composed of a metal or alloy to be sputtered and an underlying metallic backing plate member, an improved method for joining said target and backing plate along mating surfaces thereof, comprising:

a) forming a plurality of salient portions in at least one of said mating surfaces, ~~at least one of the salient portions extending into the other of said mating surfaces and extending back toward said other of said mating surfaces at a re-entrant angle less than 90° relative to a plane of the mating surfaces;~~

b) positioning said target and backing plate adjacent each other to form an assembly having an interface defined by said mating surfaces;

c) pressure consolidating said assembly under low temperature conditions less than 38°C to bondingly join said target and backing plate together with said salient portions penetrating into the other of said mating surfaces and extending back toward said other mating surfaces at a re-entrant angle of less than 90° relative to a plane between said mating surfaces.

35. (Currently amended) In a method of preparing a bonded sputter target/backing plate assembly comprising a target composed of a metal or alloy to be sputtered and an underlying metallic backing plate member, an improved method for joining said target and backing plate along mating surfaces thereof, comprising:

a) forming a plurality of projections in at least one of said mating surfaces with a peripheral boundary surrounding said projections;

b) positioning said target and backing plate adjacent each other to form an assembly having an interface defined by said mating surfaces;

c) pressure consolidating said assembly under low temperature conditions of less than 38°C and at a pressure sufficient to bondingly join said target and backing plate together with said projections penetrating into and mechanically locking over the other of said mating surfaces; and

d) e-beam welding said assembly proximate said peripheral boundary, said step d) being performed after said step b) and before said step c).

36. (Previously added) Method as recited in claim 35 wherein said step d) further comprises interposing a weldable filler material between said target and said backing plate proximate said peripheral boundary.

37. (Previously added) In a method of preparing a bonded sputter target/backing plate assembly comprising a target composed of a metal or alloy to be sputtered and an underlying metallic backing plate member, an improved method for joining said target and backing plate along mating surfaces thereof, comprising:

a) forming a plurality of projections in at least one of said mating surfaces with a peripheral boundary surrounding said projections;

b) positioning said target and said backing plate adjacent each other to form an assembly having an interface defined by said mating surfaces;

c) pressure consolidating said assembly under low temperature conditions; and

d) friction welding said assembly proximate said peripheral boundary, said target comprising copper.

38. (Currently amended) In a method of preparing a bonded sputter target/backing plate assembly comprising a target composed of a metal or alloy to be sputtered and an underlying metallic backing plate member, an improved method for joining said target and backing plate mating surfaces thereof, comprising:

a) forming a plurality of projections in at least one of said mating surfaces with a peripheral boundary surrounding said projections;

b) positioning said target and backing plate adjacent each other to form an assembly having an interface defined by said mating surfaces;

c) pressure consolidating said assembly under low temperature conditions of less than 38°C and at a pressure sufficient to bondingly join said target and backing plate together

with said projections penetrating into and mechanically locking over the other of said mating surfaces; and

d) e-beam welding said assembly proximate said peripheral boundary.

39. (Previously added) In a method of preparing a bonded sputter target/backing plate assembly comprising a target composed of a metal or alloy to be sputtered and an underlying metallic backing plate, an improved method for joining said target and backing plate along mating surfaces thereof, comprising:

a) forming a plurality of projections in at least one of said mating surfaces with a peripheral boundary surrounding said projections;

b) positioning said target and backing plate adjacent each other to form an assembly having an interface defined by said mating surfaces;

c) pressure consolidating said assembly under low temperature conditions;

d) bonding said assembly proximate said peripheral boundary; and

e) annealing said pressure consolidated assembly at low temperature.

40. (Allowed) Method of bonding a sputter target to a backing plate member along a plane defined by mating interfacial surfaces of said target and backing plate, said method comprising:

a) forming a plurality of salient portions in one of said interfacial surfaces, wherein said salient portions have at least one edge and a projection tip connected to said edge, said target and said backing plate having a peripheral boundary circumscribing said salient portions.

b) positioning said target and backing plate in a position ready for bonding with said interfacial surfaces adjacent each other,

c) consolidating said target and backing plate at a temperature of less than about 50% of the melting point of the lower melting member of said target and said backing plate and at a pressure sufficient to deform said at least one edge to form a re-entrant angle relative

to said plane of less than 90° and said projection tip forming an angled, locking grip over the other of said interfacial surfaces; and

d) e-beam welding said target and said backing plate member around said peripheral boundary, said step d) occurring prior to said step c).

41. (New) Method of bonding a sputter target to a backing plate member along a plane defined by mating interfacial surfaces of said target and backing plate, said method comprising:

a) forming a plurality of salient portions in one of said interfacial surfaces, wherein said salient portions have at least one edge and a projection tip connected to said edge,

b) positioning said target and backing plate in a position ready for bonding with said interfacial surfaces adjacent each other,

c) consolidating said target and backing plate at a temperature of less than about 50% of the melting point of the lower melting member of said target and said backing plate and at a pressure sufficient to deform said at least one edge so that at least one edge forms a re-entrant angle relative to said plane of less than 90° and said projection tip forms an angled mechanical locking grip over the other of said interfacial surfaces, said target and said backing plate having a peripheral boundary portion circumscribing said salient portions; said method further comprising

d) e-beam welding said target and backing plate member around a peripheral boundary portion of said mating interfacial surfaces, said step d) being performed prior to said step c).

42. (New) In a method of preparing a bonded sputter target/backing plate assembly comprising a target composed of a metal or alloy to be sputtered and an underlying metallic backing plate member, an improved method for joining said target and backing plate along mating surfaces thereof, comprising:

a) forming a plurality of projections in at least one of said mating surfaces to extend into and mechanically lock over the other of said mating surfaces;

b) positioning said target and backing plate adjacent each other to form an assembly having an interface defined by said mating surfaces;

c) pressure consolidating said assembly under low temperature conditions less than 38°; wherein said assembly comprises a peripheral boundary surrounding said projections, and

d) bonding said assembly proximate said peripheral boundary.

43. (New) Method as recited in claim 42 wherein said step (d) is performed after said step (b) and before said step (c).

44. (New) Method as recited in claim 43 wherein said step (d) comprises e-beam welding of said peripheral boundary.

45. (New) Method as recited in claim 44 wherein said step (d) further comprises interposing a weldable filler material between said target and said backing plate proximate said peripheral boundary.

46. (New) Method as recited in claim 42 wherein said step (d) comprises friction welding.

47. (New) Method as recited in claim 42 wherein said step (d) comprises TIG welding.

48. (New) Method as recited in claim 42 wherein said target comprises Cu.

49. (New) Method as recited in claim 42 wherein said step (d) comprises e-beam welding said target along an annular zone located adjacent said peripheral boundary.

50. (New) Method as recited in claim 42 further comprising (e) low temperature annealing said pressure consolidated assembly.